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(Lum. 4.1-88)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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Serial No.: 10/715,284 Art Unit: 1639

Filed: Nov. 17, 2003 Examiner: Christopher M. Gross

For: CLEAVABLE SOLID PHASES FOR ISOLATING NUCLEIC ACIDS

Mail Stop Appeals Brief-Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF UNDER 37 CFR § 41.37

Sir:

On July 19, 2007, Appellants filed a Notice of Appeal of a Final Rejection in the Office Action of January 25, 2007. This appeal covers claims 1, 2, 4, 5, 8-12, 22, 23, 27, and 28 which were rejected on prior art grounds and/or for failing to comply with the written description requirement.

Please charge the requisite fee of **\$500.00** for filing this Appeal Brief pursuant to 37 CFR § 41.20(b)(2) and the fee of **\$120.00** for a one month extension of time pursuant to 37 CFR § 1.17(a)(1) to **Deposit Account No. 50-4094**. Also please charge any other required fees or credit any overpayment to the above Deposit Account.

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I - Real Party in Interest

The assignee of this application is NexGen Diagnostics LLC.

II - Related Appeals and Interferences

There are no other related appeals or interferences.

III - Status of Claims

Claims 1-28 are pending in the Application. Claims 1, 2, 4, 5, 8-12, 22, 23, 27, and 28 have been finally rejected. Claims 3, 6, 7, 13-21 and 24-26 are withdrawn. Claims 1, 2, 4, 5, 8-12, 22, 23, 27, and 28 are on appeal.

IV - Status of Amendments

An amendment was filed after Final Rejection, on April 12, 2007. Entry of the amendment was denied in an Advisory Action mailed on July 10, 2007.

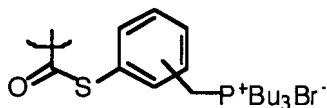
V - Summary of Claimed Subject Matter

Independent Claim 1 is directed to a solid phase material for binding nucleic acids. The claimed materials comprise three elements: 1) a solid matrix comprising at least one of silica, glass, insoluble synthetic polymers, or insoluble polysaccharides (Pg. 12, ln. 19-22; Pg. 18, ln. 2-5), 2) a nucleic acid binding portion comprising at least one of a ternary sulfonium group, a quaternary ammonium, or a quaternary phosphonium group (Pg. 11, ln. 28-Pg. 12, ln. 9; Pg. 13, ln. 2-6; Pg. 18, ln. 6-10), and 3) a cleavable linker portion linking the nucleic

acid binding portion to the solid support ((Pg. 12, ln. 24-26; Pg. 18, ln. 10-16; Figs. 1 and 2).

Independent Claim 27 is directed to a solid phase material for binding nucleic acids. The claimed materials comprise three elements: 1) a solid matrix comprising at least one of silica, glass, insoluble synthetic polymers, or insoluble polysaccharides (Pg. 12, ln. 19-22; Pg. 18, ln. 2-5), 2) a quaternary phosphonium group nucleic acid binding portion (Pg. 11, ln. 28-Pg. 12, ln. 9; Pg. 13, ln. 2-6; Pg. 18, ln. 6-10), and 3) an ester or thioester group cleavable linker portion linking the nucleic acid binding portion to the solid support (Pg. 20, ln. 4-5; Pg. Pg. 20, ln. 25 – Pg. 26, ln. 10;).

Independent Claim 28 is directed to a solid phase material for binding nucleic acids. The claimed materials comprise three elements: 1) comprising at least one of silica, glass, insoluble synthetic polymers, or insoluble polysaccharides (Pg. 12, ln. 19-22; Pg. 18, ln. 2-5), 2) a quaternary phosphonium group nucleic acid binding portion (Pg. 11, ln. 28-Pg. 12, ln. 9; Pg. 13, ln. 2-6; Pg. 18, ln. 6-10), and 3) a cleavable linker portion linking the nucleic acid binding portion to the solid support comprising a thioester having the formula:



(Examples 13-16, 18, and 20-22).

VI - Grounds of Rejection to be Reviewed on Appeal

VII.A. Whether claims 1, 2, 4, 8, and 11 are unpatentable under 35 U.S.C 103(a) over Hughes (1996 Tetrahedron Letters 37: 7595-7598) in view of Lough

et al (US 5,900,481).

VII.B. Whether claims 1, 2, 4, 5, 8-12, 22, 23, 27, and 28 are unpatentable under 35 U.S.C 112, first paragraph as failing to comply with the written description requirement.

VII - Argument

VII.A. Whether claims 1, 2, 4, 8, and 11 are unpatentable under 35 U.S.C 103(a) over Hughes in view of Lough.

1. CLAIM ELEMENT LACKING IN REFERENCES

Claims 1, 2, 4, 8, and 11 were rejected as unpatentable under 35 U.S.C 103(a) over Hughes in view of Lough. Appellants respectfully disagree and maintain that the rejection fails to establish a *prima facie* case of obviousness since the combined teachings of Hughes and Lough do not teach all elements of the rejected claims. Lough *et al.* teaches a bead conjugated to a solid support and further conjugated to at least one nucleic acid, U.S. 5,900,481, column 2, lines 1-3 and claim 1. The materials are disclosed to be used for immobilization of known or selected nucleic acid sequences and for hybridization of selected nucleic acids to the nucleic acid conjugated to the bead. The nucleic acid-conjugated bead provides a higher density means of immobilizing nucleic acids to solid supports compared to prior art direct conjugation of nucleic acids to solid supports. Lough

further teaches that the means for conjugating the either or both of the solid support and the nucleic acid to the bead may be use of a cleavable linker. Hughes discloses a solid support for traceless synthesis of organic molecules. A triphenylphosphonium polymeric bead is employed to covalently link a candidate molecule via a fourth bond to phosphorus in order to perform synthetic manipulation on the molecule. The molecule is then released by cleaving the aforementioned fourth bond between the phosphorus and the compound. Different chemical reactions are disclosed in Hughes for performing this cleavage. Examples include a Wittig reaction and a hydrolysis reaction. In all examples the phosphorus remains attached to the bead and may in some cases be converted to a phosphine oxide moiety in the process of the cleavage reaction. The latter species features an additional phosphorus-oxygen bond. The Examiner takes the position that it would be obvious to one of skill in the art:

to employ the chemistry developed by Hughes with the nucleic acid binding silica beads of Lough et al. ... to take advantage of the chemical versatility afforded by orthogonal nucleic acid binding, as noted by Lough et al on page in column 5 lines 18-31.

This rejection is clearly in error because the proposed combination results in a material in which one or more elements of the claims are missing. Claim 1 and the claims dependent thereon require both “a nucleic acid binding portion for attracting and non-covalently and non-sequence specifically binding nucleic acids wherein the nucleic acid binding portion comprises at least one of a ternary sulfonium group, a quaternary ammonium, or a quaternary phosphonium group

$\text{PR}_3^+ \text{X}^-$ and “a cleavable linker portion linking the nucleic acid binding portion to the solid support”. Claims 27 and 28 differ by narrowing the scope of the nucleic acid binding group and the cleavable linker.

It remains unclear to Appellants how the references are being combined and which reference is being used to modify the other. The Examiner has consistently failed to make clear how the chemistry of Hughes would be applied to the beads of Lough to arrive at a material that renders the rejected claims obvious. Appellants are left to speculate how the proposed combination would take form. As Appellants understand this hypothetical material, the cleavable phosphonium chemistry of Hughes would be used to modify the solid support/bead/nucleic acid construct of Lough. This could be accomplished either by using a phosphonium group in a linker connecting the bead to the solid support or in a linker connecting the bead to the nucleic acid of Lough. The former case fails to meet the claim limitation that the cleavable linker group links the solid support to a sulfonium, phosphonium or ammonium nucleic acid binding group. In the latter case, where the cleavable linker would join the bead to the nucleic acid binding group, then the nucleic acid binding group would be one or more specific capture nucleic acids. This fails to meet the claim limitation of “a nucleic acid binding portion comprises at least one of a ternary sulfonium group, a quaternary ammonium, or a quaternary phosphonium group”. Further it can not be held that the cleavable phosphonium linker of Hughes could be both the cleavable linker and the nucleic acid binding group. The rejected claims clearly require discrete elements.

As set forth in MPEP §2143.03:

To establish prima facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." In re Wilson, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious. In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

Appellants have gone out of their way to give the most charitable interpretations possible to the Examiner's ground of rejection. Nevertheless each one results in the lack of one of the discrete claim elements. Since the references, alone or in combination, fail to teach both a nucleic acid binding portion for attracting and non-covalently and non-sequence specifically binding nucleic acids wherein the nucleic acid binding portion comprises at least one of a ternary sulfonium group, a quaternary ammonium, or a quaternary phosphonium group $PR_3^+ X^-$ and a cleavable linker linking the nucleic acid binding portion to the solid support, the rejection is improper and should be reversed.

2. CLAIM LIMITATION HAS BEEN IMPROPERLY INTERPRETED

The Examiner has stated the position (Advisory Action dated July 10, 2007) that:

in giving the claims the broadest reasonable interpretation, removal of the salt is not recited in the claims: The Examiner has interpreted “a cleavable linker portion” as referring to removal (cleavage) of a nucleic acid from the solid support

apparently relying on MPEP § 2111.01, parts I and II. Appellants respectfully disagree with this position and maintain that the rejection is improper and fails to establish a *prima facie* case of obviousness. The aforementioned MPEP § 2111.01, part I also reads, in part:

This means that the words of the claim must be given their plain meaning unless **>the plain meaning is inconsistent with< the specification. In re Zletz, 893 F.2d 319, 321, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989) (discussed below); Chef America, Inc. v. Lamb-Weston, Inc., 358 F.3d 1371, 1372, 69 USPQ2d 1857 (Fed. Cir. 2004) (Ordinary, simple English words whose meaning is clear and unquestionable, absent any indication that their use in a particular context changes their meaning, are construed to mean exactly what they say.

Appellants maintain that the Examiner’s interpretation of the meaning of the claim in the passage above is not reasonable in light of the specification. It is in fact at odds with the clearly identified meaning of the disputed term. It is clearly seen that the cleavable linker is intended to describe an intervening group whose cleavage separates a linked nucleic acid binding group and solid support. This meaning is consistently stated and depicted throughout the drawings, written description and worked examples, see e.g. Fig. 1A; Fig. 2; Pg. 18, ln. 10-16; Pg. 19, ln. 28-Pg. 28, ln. 4; and examples 25, 28, 29, 31-45, 62, 67, 70, and 71). Moreover, the specification describes an embodiment where cleaving the solid phase is separate from releasing the nucleic acid from the cleaved solid phase,

paragraph 0089-0091. Cleaving the linker cannot be equated with cleaving the nucleic acid from the support.

It is only by distorting the meaning of the claim element “a cleavable linker portion linking the nucleic acid binding portion to the solid support” that the hypothetical material postulated from the combined teachings of Hughes and Lough can be made to fit this claim term. The Examiner contends that he may substitute for this term any material that cleaves the nucleic acid from the solid support since Applicants did not specifically recite “cleavage of the onium salt” in the rejected claim(s), Final Office Action, page 4. Reliance is then made in the rejection on the chemistry of Hughes. In the chemistry described in this reference a quaternary phosphonium group is subjected to a reaction that cleaves one of the carbon-phosphorus bonds but deliberately leaves intact the linkage between the phosphorus and the polymeric bead. The resulting bead-appended phosphorus atom becomes part of a putative “neutral” phosphine oxide group under Wittig reaction cleavage conditions. The Examiner implies, without any basis in evidence, that conversion of a phosphonium group to a neutral phosphine oxide would cause “cleavage” of the nucleic acid from the solid phase even though the phosphorus-containing group is never cleaved from the solid phase. This hypothetical mode of operation is found nowhere in Applicants’ disclosure or in any document of record. The fate of the phosphorus atom under the disclosed hydrolytic cleavage is unspecified in Hughes. Appellants are left to guess how this applies to the rejection and how such a material would render the rejected claims obvious. Appellants maintain that the Examiner’s dubious interpretation of

the meaning of the term “cleavable linker portion” in the rejected claims is not a reasonable reading of the claim. Since Applicants are entitled to be their own lexicographer and have clearly and consistently demonstrated the meaning of the term “cleavable linker portion”, substitution of an alternative, contradictory definition to support a finding of unpatentability is impermissible. Seen in the light of these facts, the rejection is improper and should be reversed.

3. UNSUPPORTED SPECULATION

As described above the combination of Hughes and Lough is proposed to fashion a material having a cleavable phosphonium group for adsorbing nucleic acids and that cleaving one of the groups from the phosphorus would not free the phosphorus from the solid material. The Examiner points out in the Final Office Action that such a material is electrostatically neutral after cleavage and thus “a cleavable linker portion linking the nucleic acid binding portion to the solid support”, presumably due to the change in the charge state of the resulting material. The resulting bead-appended phosphorus atom becomes part of a putative “neutral” phosphine oxide group under the Wittig reaction cleavage conditions described in Lough. This theory is based on unproven conjecture and speculation about such a material and how it might work.

As set forth in MPEP §2143.03:

The rationale to support a rejection under 35 U.S.C. 103 may rely on logic and sound scientific principle. In re Soli, 317 F.2d 941, 137 USPQ 797 (CCPA 1963). However, when an examiner relies on a scientific

theory, evidentiary support for the existence and meaning of that theory must be provided. In re Grose, 592 F.2d 1161, 201 USPQ 57 (CCPA 1979) ...

Although the theoretical mechanism of an invention may be explained by logic and sound scientific reasoning, this fact does not support an obviousness determination unless logic and scientific reasoning would have led one of ordinary skill in the art to make the claimed invention. Ex parte Levengood, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993).

This holding is without written support in any document of record or any reference of which Appellants are aware and appears to be based on the Examiner's personal knowledge or belief. If so, the Examiner is invited to declare so by submitting an affidavit to that effect into the record or must provide evidence supporting this position. Moreover, Appellant has already introduced evidence casting doubt on the operability of the Examiner's theory in the form of an article (E.L. Wagner, *J. Am. Chem. Soc.* **85**, 161-164 (1963)). Wagner teaches that phosphine oxides have substantial charge separated character, so much so that they are best described as having a full positive charge on phosphorus and full negative charge on oxygen leading to a net zero charge. The effect of this strong polarization of charge on nucleic acid binding and release is unknown, but can not blithely be dismissed. Since one of skill in the art, considering the evidence of record, would likely have substantial doubts about the functioning of the Examiner's proposed material, it could not provide a reasonable likelihood of success. Failing this it can not serve as a basis for establishing a *prima facie* case of obviousness. The rejection of Appellants' claims should be reversed because

the rejection fails to provide sufficient motivation to establish a prima facie case of obviousness.

4. LACK OF MOTIVATION TO COMBINE REFERENCES

The proposed combination of references suffers from yet another defect as a basis upon which to hold that the rejected claims are unpatentable for obviousness. The stated intention of patentees Lough *et al.* in creating their solid support – bead – nucleic acid system is to provide a material for high density, controlled immobilization of desired nucleic acids for further subsequent characterization, analysis, or hybridization with complementary nucleic acids. Such subsequent uses are listed in a passage in Lough at column 5, line 45 to column 6, line 3. All examples and much of the disclosure focuses on chemical modification of the selected nucleic acids in order to permit coupling to the beads. The aim of Lough was not to indiscriminately immobilize any and all nucleic acids present in a sample to a solid support. To do so would thwart the ability to perform the desired analyses and techniques. Using the quaternary phosphonium chemistry of Hughes as a “cleavable linker” for immobilizing nucleic acids to a bead, the objections noted in previous sections notwithstanding, would provide a bead surface that makes selective hybridization impossible. Not only would the phosphonium groups attract the selected nucleic acid to be specifically attached, it would also attract all nucleic acids to which it was subsequently exposed. This would happen for example in the technique Sequencing By Hybridization (SBH)

referred to in Lough. The addressable arrays required in this and similar techniques would not be addressable due to the non-sequence dependent binding. It is telling that reversible immobilization of nucleic acids on positively charged surfaces was well known in the art before the time of Lough's invention but is not mentioned as a means of linking nucleic acids to beads. (See e.g. U.S. Patent 4,935,342, cited in the present specification) One seeking to prepare materials for high density, controlled immobilization of desired nucleic acids would not be motivated to combine the chemistry of Hughes with the materials of Lough because the quaternary phosphonium group would lead to nonspecific binding of nucleic acids to the bead an/or solid support and render it useless for performing many of its functions. Thus, there is insufficient motivation to combine references because the proposed modification would render Lough inoperative for its intended purpose. Appellants seek reversal of the rejection for this added reason that the rejection fails to provide a motivation to establish a prima facie case of obviousness.

VII.B. Whether claims 1, 2, 4, 5, 8-12, 22, 23, 27, and 28 are unpatentable under 35 U.S.C 112, 1st ¶ as failing to comply with the written description requirement.

CLAIM TERM HELD TO FIND LACK OF WRITTEN SUPPORT REFLECTS INHERENT PROPERTY AS DEMONSTRATED IN EXAMPLES

It was asserted that the specification as originally filed provided no implicit or explicit support for “non-covalently and non-sequence specifically

binding nucleic acids,” as contained in claims 1, 27, and 28. Appellants respectfully disagree. As stated in MPEP 2173.05(i), “a lack of literal basis in the specification for a negative limitation may not be sufficient to establish a prima facie case for lack of descriptive support. *Ex parte Parks*, 30 USPQ2d 1234, 1236 (Bd. Pat. App. & Inter. 1993).” In *Ex parte Parks*, the Board of Patent Appeals and Interferences reversed a rejection under the first paragraph of 35 USC § 112 for a lack of support for the claim limitation, “in the absence of a catalyst,” where the disclosure did not mention a catalyst because “it cannot be said that the originally-filed disclosure would not have conveyed to one having ordinary skill in the art that appellants had possession of the concept of conducting the decomposition step . . . in the absence of a catalyst.” 30 USPQ2d at 1236.

The “fundamental inquiry” with respect to the written description requirement “is whether the specification conveys with reasonable clarity to those skilled in the art that, as of the filing date sought, applicant was in possession of the invention as now claimed.” MPEP 2163.02. Moreover, the CCPA stated in a related context that “applicants frequently discover during the course of prosecution that only a part of what they invented and originally claimed is patentable.” *In re Wertheim*, 541 F.2d 257, 263, 191 USPQ 90 (CCPA 1976). An applicant has the right “to retreat to an otherwise patentable species merely because he erroneously thought he was first with the genus when he filed.” *Id.*

Applicants maintain that it is readily understood from the disclosure and the worked examples that the binding of nucleic acids to the presently claimed materials is not dependent on recognition of a particular base sequence and does not occur by covalent bond formation between the nucleic acids and the presently claimed materials. These properties are inherent in the nature of the materials by virtue, at least, of the nature of the nucleic acid binding portion. The Examiner recognizes that ternary and quaternary onium groups function, at least in part, by electrostatic attraction of nucleic acids. It is known from references already of record, e.g. US 4,699,717; US 5,057,426; EP 124349, that quaternary ammonium groups bind DNA by this mechanism and do so noncovalently and non-sequence specifically. Moreover capture of nucleic acids by sequence recognition or covalent bond formation is nowhere disclosed in the present specification. The objected to terms merely represent inherent properties of the nucleic acid binding groups disclosed (ternary sulfonium group, quaternary ammonium, quaternary phosphonium group PR_3^+X^- ; and ternary sulfonium group of the formula SR_2^+X^- where R is selected from C_1 - C_{20} alkyl, aralkyl and aryl groups, quaternary ammonium group of the formula NR_3^+X^- where R is selected from C_4 - C_{20} alkyl, aralkyl and aryl groups, and quaternary phosphonium group of the formula PR_3^+X^- where R is selected from C_1 - C_{20} alkyl, aralkyl and aryl groups, and wherein X is an anion; and quaternary phosphonium group where the R groups each contain from 1-20 carbon atoms). In contrast to the Examiner's statement,

noncovalent and non-sequence specific binding is certainly implicit in every worked example. For instance, examples 43 and 68 demonstrate the binding of genomic DNA containing a myriad of different sequences and lengths of nucleic acid. Other examples demonstrate binding of RNA or plasmid DNA. No covalent modification is involved and no sequence recognition is involved.

Because “the ternary or quaternary onium solid phase materials remain positively charged regardless of the pH of the reaction medium,” application, page 12, lines 14-18, these groups have the ability to attract nucleic acids of a variety of lengths and sequences and bind them without covalent bonding and without sequence specific binding.

Because there is no violation of the written description requirement, Appellants request the Examiner to withdraw the rejection of claims 1, 2, 4, 5, 8-12, 22, 23, 27, and 28 under 35 USC § 112, first paragraph.

Appellants point out that the foregoing argument was previously advanced in a proposed Amendment After Final Rejection. Although the amendment was not entered, an Advisory Action issued in response indicated that the argument “appears likely persuasive”. Appellants respectfully request the Board to reverse the rejection.

CONCLUSION

_____The rejection under 35 USC 103 should be reversed for a number of reasons. First, the claim elements regarding the specific “a nucleic acid binding portion” and “a cleavable linker portion linking the nucleic acid binding portion to the solid support” recited in the independent claims are missing in the references. Second, the rejection is based on an erroneous interpretation of the claim language “a cleavable linker portion linking the nucleic acid binding portion to the solid support.” Third, the rejection should be reversed as being based on unsupported speculation regarding the fate of the phosphorus group in Hughes and because Appellant has introduced evidence casting doubt on the operability of the Examiner’s theory such that one of skill in the art, considering the evidence of record, would likely have substantial doubts about the functioning of the Examiner’s proposed material, and the likelihood of success of the proposed modification. Fourth, there is insufficient motivation to combine references because the proposed modification of Lough would render Lough inoperative for its intended purpose.

The rejection under 35 USC 112 should be reversed because Appellant's disclosure reasonable conveys the claimed subject matter. Appellant respectfully requests the Board to reverse all of the rejections.

Respectfully submitted,

Richard Handley

Richard S. Handley, Ph.D.
Registration No. 38,484

Dated: September 27, 2007

VIII - Claims Appendix

1. A solid phase for binding nucleic acids comprising:
 - a solid support portion comprising a matrix comprising at least one of silica, glass, insoluble synthetic polymers, or insoluble polysaccharides,
 - a nucleic acid binding portion for attracting and non-covalently and non-sequence
 - 5 specifically binding nucleic acids wherein the nucleic acid binding portion comprises at least one of a ternary sulfonium group, a quaternary ammonium, or a quaternary phosphonium group $\text{PR}_3^+ \text{X}^-$, and
 - a cleavable linker portion linking the nucleic acid binding portion to the solid support.
2. The solid phase of claim 1 wherein the nucleic acid binding portion is selected from a ternary sulfonium group of the formula $\text{SR}_2^+ \text{X}^-$ where R is selected from C_1 - C_{20} alkyl, aralkyl and aryl groups, a quaternary ammonium group of the formula $\text{NR}_3^+ \text{X}^-$ where R is selected from C_4 - C_{20} alkyl, aralkyl and aryl groups, and a quaternary phosphonium
- 5 group of the formula $\text{PR}_3^+ \text{X}^-$ where R is selected from C_1 - C_{20} alkyl, aralkyl and aryl groups, and wherein X is an anion.
4. The solid phase of claim 2 wherein the nucleic acid binding portion is a quaternary phosphonium group and the R groups each contain from 1-20 carbon atoms.
5. The solid phase of claim 4 wherein each R group is a butyl group.

8. The solid phase of claim 1 wherein the solid support portion comprises a silica matrix.

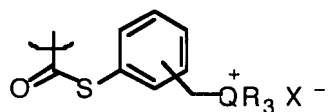
9. The solid phase of claim 1 wherein the cleavable linker portion further comprises one or more connecting portions.

10. The solid phase of claim 1 further comprising a magnetically responsive portion.

11. The solid phase of claim 1 wherein the cleavable linker portion is hydrolytically cleavable.

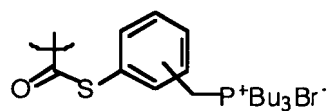
12. The solid phase of claim 11 wherein the hydrolytically cleavable linker portion is an ester or thioester group.

22. The solid phase of claim 12 wherein the cleavable linker portion comprises a thioester having the formula:



wherein Q is P or N and R is alkyl of 1-20 carbons.

23. The solid phase of claim 22 wherein the cleavable linker portion comprises a thioester having the formula:



27. A solid phase for binding nucleic acids comprising:

a solid support portion comprising a matrix comprising at least one of silica,
glass, insoluble synthetic polymers, or insoluble polysaccharides,

a nucleic acid binding portion for attracting and non-covalently and non-sequence

5 specifically binding nucleic acids wherein the nucleic acid binding portion is a

quaternary phosphonium group $\text{PR}_3^+ \text{X}^-$ wherein R is selected from $\text{C}_1\text{-C}_{20}$

alkyl, aralkyl and aryl groups, and wherein X is an anion, and

a cleavable linker portion linking the nucleic acid binding portion to the solid

support wherein the cleavable linker portion is an ester or thioester group.

28. A solid phase for binding nucleic acids comprising:

a solid support portion comprising a matrix comprising at least one of silica,
glass, insoluble synthetic polymers, or insoluble polysaccharides,

a nucleic acid binding portion for attracting and non-covalently and non-sequence

5 specifically binding nucleic acids wherein the nucleic acid binding portion is a

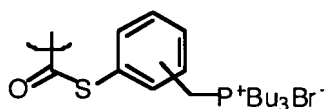
quaternary phosphonium group $\text{PR}_3^+ \text{X}^-$ wherein R is selected from $\text{C}_1\text{-C}_{20}$

alkyl, aralkyl and aryl groups, and wherein X is an anion, and

a cleavable linker portion linking the nucleic acid binding portion to the solid

support wherein the cleavable linker portion comprises a thioester having the

10 formula:

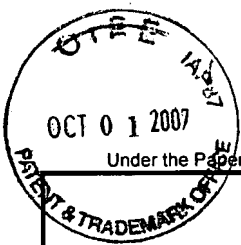


(IX) - Evidence Appendix

None

(X) - Related Proceedings Appendix

None



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